

What is claimed is:

1. A device for delivering a metered quantity of a liquid ophthalmic product to an eye comprising:

a body having a first cavity and an opening at the outer end of said cavity that is adapted for surrounding engagement with the mouth of a bottle containing a liquid ophthalmic product, a transverse bore in said body communicating with said first cavity, a discharge orifice at one side of said body, a holding chamber connecting said transverse bore and said discharge orifice, and at least one passageway communicating with said holding chamber;

a metering member rotatably disposed in said transverse bore, said metering member comprising a second cavity for holding a predetermined quantity of a liquid ophthalmic product, said metering member being rotatable between a first position wherein said second cavity is open to said first cavity whereby liquid ophthalmic product can flow via gravity from said first cavity into said second cavity and a second position wherein said second cavity is aligned with said holding chamber and liquid ophthalmic product can spill out of said second cavity into said holding chamber; and

selectively operable means for injecting air into said holding chamber via said at least one passageway, whereby said air will expel liquid ophthalmic product from said holding chamber to the atmosphere via said orifice.

2. A device according to claim 1 wherein said orifice comprises a separately formed member that is disposed in a side port in said body, said separately formed member having a relatively large opening facing said holding chamber and a relatively small opening facing the atmosphere exterior of said body.

3. A device according to claim 1 wherein said selectively operable means comprises an air pressure chamber within said body and connected to said at least one passageway, normally closed valve means for controlling flow of air from said air pressure chamber to said at least one passageway; and manually operable piston means for forcing air from said air pressure chamber so as to cause said valve means to open and allow said air to flow into said at least one passageway under pressure.

4. A device according to claim 3 wherein said body has at least one opening communicating at one end with said air pressure chamber and at the other end with said at least one passageway, said normally closed valve means comprises a valve member interposed between said at least one opening and said at least one passageway and spring means urging said valve member into a closed position, said spring means having a relatively low stiffness whereby it can be caused to allow said valve member to open under air pressure applied by movement of said manually operable piston means.

5. A device according to claim 4 wherein said air pressure chamber has an open end, and said piston means comprises a piston member slidably mounted in said open end for telescoping movement relative to said body.

6. A device according to claim 5 wherein said piston means includes a spring urging said piston outwardly of said body.

7. A device according to claim 1 further including means for manually rotating said metering member.

8. A device according to claim 7 wherein said last-mentioned means is located outside of said body;

9. A device according to claim 8 wherein said last-mentioned means is a lever, and further wherein when said metering member is in said second position, said lever will extend laterally of said body along a line generally parallel to the center line of said orifice.

10. A device according to claim 9 wherein said lever has an end portion for engaging a person's face and a length such that when said end portion is engaged with a person's face said orifice will be spaced approximately 1.25 inches from the person's eye.

11. A device according to claim 1 wherein said body has an exterior surface with a flared recessed area surrounding said orifice, whereby to facilitate discharge of fluid from said orifice in the form of a spray.

12. A device according to claim 3 wherein said air pressure chamber comprises an opening at one end of said body in line with said cavity, and said manually operable piston means is in the form of a cup having an end wall and a tubular side wall, with said tubular side wall being disposed in telescoping relation with said opening and said end wall being disposed outside of said body and coacting with said tubular side wall to close of said air pressure chamber.

13. A device according to claim 12 further including means preventing said cup from separating from said body.

14. A device according to claim 13 further including a compression spring disposed between said cup and said body and urging said cup outwardly of said body.

15. A device according to claim 3 wherein said air pressure chamber is defined in part by a first cup-shaped member inserted into an opening in said body and in part by said piston means, said piston means comprising a second cup-shaped member mounted in telescoping relation with said first cup-shaped member.

16. A device according to claim 1 wherein said orifice has a longitudinal axis and is oriented so that said axis extends normal to the axis of rotation of said metering member.

17. A device according to claim 16 wherein said opening at the outer end of said first cavity is adapted to hold a bottle so that it is normal to the axis of rotation of said metering member and normal to the longitudinal axis of said orifice.

18. A device according to claim 1 wherein said second cavity has a volume of about 10 to about 12 microliters.

19. A device for delivering a metered quantity of a liquid ophthalmic product to an eye comprising:

a body having an interior opening, means for supporting a bottle containing a liquid ophthalmic product so that the interior of said bottle communicates with said interior opening, a holding chamber in said body displaced 90° from said interior opening, and a discharge orifice communicating with said holding chamber;

metering means in said body for receiving a small amount of liquid ophthalmic product from said bottle via said interior opening and transferring said small amount of liquid ophthalmic product to said holding chamber;

means exterior of said body for moving said metering means between a first position in which it communicates with said interior opening and a second position in which it communicates with said holding chamber; and

pneumatic means for expelling said small amount of liquid ophthalmic product from said cavity holding chamber and discharging it via said discharge orifice in the form of a spray.

20. A device according to claim 19 wherein said pneumatic means comprises a passageway connecting with said holding chamber, and manually operable piston means for forcing a stream of air through said passageway to said discharge orifice, whereby liquid ophthalmic product in said holding chamber is entrained in said air stream and expelled from said orifice as an atomized spray.

21. A device in accordance with claim 20 further including a bottle containing a liquid ophthalmic product, said bottle having a mouth attached to said body and communicating with said interior opening.

22. A device according to claim 21 wherein said discharge orifice is sized so that the surface tension of said liquid ophthalmic product prevents it from leaking out of said holding chamber via said discharge orifice.

23. A device for delivering a metered quantity of a liquid ophthalmic product to an eye comprising:

a body having a transverse bore, an internal cavity having an inner end with a first opening that communicates with said bore and an outer end with a second opening that is adapted for connection with the mouth of a bottle containing a liquid ophthalmic product, a discharge orifice at one side of said body, a holding chamber connecting said transverse bore and said

discharge orifice, and at least one passageway communicating with said holding chamber;

a metering member rotatably disposed in said transverse bore, said metering member comprising a cavity for holding a predetermined quantity of a liquid ophthalmic product, said metering member being rotatable between a first position wherein said cavity communicates with said first opening and liquid ophthalmic product can flow into said cavity via gravity from a bottle that is connected to said second opening and a second position wherein said cavity is aligned with said holding chamber and liquid ophthalmic product can spill out of said cavity into said holding chamber; and

selectively operable means for injecting air into said holding chamber via said at least one passageway, whereby said air will expel liquid ophthalmic product from said holding chamber to the atmosphere via said orifice.